ORIGINAL ARTICLE

Prescription Patteerns and Medication Adherence of Antimicrobials of Diabetic Patients in Department of General Surgery at Tertiary Care Hospital

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Abstract

Objective: This prospective observational study aimed to analyze the prescribing patterns and medication adherence of antimicrobials in diabetic foot patients in the department of general surgery at a tertiary care hospital. A total of 120 diabetic foot patients were assessed in this study for the period of 6 months. This study mainly describes about the antimicrobial usage and current prescription patterns of antimicrobials in patients of diabetic foot ulcer (DFU). By empowering patients to understand the rationale behind their treatment regimens and the consequences of non-adherence, healthcare providers can enhance patient engagement and promote self-management. Medication adherence is effectively measured by Morisky Medication Adherence Scale 8-item (MMAS-8). **Purpose of the Study:** The purpose of this study is to analyse the prescribing patterns and medication adherence of antimicrobials in diabetic foot patients in the department of general surgery. Evaluating the antimicrobial usage by MMAS-8. **Methods:** This study was carried out in a tertiary care teaching hospital located in South India, over 6 months from October 2023 to March 2024. The study assessed the antimicrobial usage in the management of DFU, current prescription patterns of antimicrobials, and Medication adherence. **Conclusion:** In conclusion, this study provided insights into prescribing patterns and medication adherence in diabetic foot patients receiving antimicrobial therapy, aiding the understanding of DFU management. Variations in prescription patterns highlight the need for standardized guidelines to optimize treatment and minimize antimicrobial resistance risks. Improving medication adherence and patient education is crucial for better clinical outcomes and reduced healthcare burden associated with diabetic foot complications.

Key words: Antimicrobial therapy, barriers, diabetic foot ulcers, diabetic foot ulcer assessment scale, medication adherence, Morisky medication adherence scale 8-item, treatment regimens, Wagner grading system

INTRODUCTION

Diabetes mellitus (DM) is a chronic sickness that impacts individuals of all socioeconomic backgrounds equally. It is an illness that affects rich and poor, children and old, industrialized, and less developed. At now, 65.1 million individuals in India suffer from diabetes.[1] Chronic diabetic ulcers are a growing concern because of the rising prevalence of DM. Among the terrible consequences of DM, diabetic foot ulcers (DFUs) are the main reason diabetic individuals need to be hospitalized. 10–15% of hospital admissions are related to serious foot infections, and 15–20% of diabetic individuals experience foot difficulties. Complications from DM account for half of all non-traumatic major amputations. Inadequate and delayed

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treatment regarding DFU and infections accounts for about 85% of diabetic foot amputations.[2] These ulcers can lead to lower limb amputations, significant morbidity, significant financial burden, and frequent infection.[3] Antibiotics are still the first line of treatment for bacterial illnesses nowadays. But their careless use is no more seen as harmless. This has due to the re-emergence of bacteria that previously appeared to be losing the battle to survive, which has raised the likelihood of treatment failure and illness consequences.[4] Approaches to tackle the escalating issue of antibiotic resistance prioritize treating ailments for which antibiotic usage is necessary. Clinicians frequently deal with three situations when local antibiotic administration may be beneficial in the treatment of a diseased DFU: (1) infected DFUs; (2) soft tissue infections without diabetic foot osteomyelitis (DFO); and (3) DFO. The potential local antibiotics provide to lessen the amount of antibiotics required, their capacity to attain high concentrations of antimicrobial agents in the localized infected area, their limited systemic absorption and decreased adverse events, and their obvious safety in regard to multidrug resistance all contribute to the emergence and attractiveness of these antibiotics for diabetic foot infection (DFI) and DFO.[5]

As soon as the infection begins to react, oral therapy should be used.[6] Studies on the prescription of drugs can reveal patterns of irrational prescribing and recommend changes to the way prescriptions are currently written. These adjustments will not only result in reduced treatment costs and non-compliance, but also lessen the likelihood of problems. The study's objective was to investigate the pattern of medicine prescription among adult patients with diabetes.[7]

METHODS

This study was conducted as a prospective observational study of 6 months, from October 2023 to March 2024, in the General Surgery Department of Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, a tertiary care teaching hospital in South India. The study aimed to analyze the prescribing patterns and medication adherence of antimicrobials in diabetic foot patients. The hospital serves as a referral centre for patients from Tirupati and surrounding districts, handling approximately 1200 patients annually in both inpatient and outpatient settings.

The study design was a prospective observational study, focusing on patients diagnosed with DFU who are using antimicrobial therapy. Ethical approval was obtained from the Institutional Human Ethical Committee of SVIMS, and administrative clearance was secured from the hospital authorities before commencing the study. The study population included adult patients aged 30–80 years residing in India with type 2 DM (previously diagnosed or newly diagnosed), presented with commonly and routinely noticed lower extremity infections. Patients with foot infections due to any other causes such as nondiabetic-post-traumatic, arterial disorder alone, venous disorder alone, non-diabetic peripheral neuropathy.[8] Patients having an allergy to antimicrobial agents and Patients with chronic kidney disease were excluded from the study. The study procedure involved the recruitment of patients based on inclusion and exclusion criteria after obtaining written informed consent. An Morisky Medication Adherence Scale 8-item (MMAS-8) was used. Data were collected from patients' medical records, including admission notes, discharge summaries, and Treatment charts. Demographic details such as age and sex were recorded, and patients were interviewed to obtain a detailed medical history. Physical and systemic examinations were conducted, and findings were documented using a pre-designed pro forma. Information on medication and Medication Adherence, during hospitalization was gathered from treatment charts, nurses' notes, and MMAS- 8 scores. Statistical analysis was performed using the Statistical Package for the Social Sciences version 20. The minimum sample size required for the study was 120 patients. Descriptive and inferential statistical analyses were conducted, with bivariate analysis performed using the Chi-square test. The study aimed to assess the prescription patterns of antimicrobials and medication adherence by analysing MMAS -8 score. The findings were used to evaluate adherence to antibiotic guidelines and to reduce DFIs, to decrease in hospitalization rates, amputation rates, to manage antibiotic resistance among DFU patients.[9]

RESULTS

The study evaluated the prescription patterns and medication adherence in diabetic foot patients. A total of 120 patients were included. The majority were male (64.16%) among them 35.84% were alcoholics and 18.34% were smokers. The present study depicted that alcoholic patients (n = 43, 35.84%) were more prone to get diabetic infections which was similar to the study done by Khan, T. The present study depicted that left diabetic foot (n = 29) was one of the most common chief complaints, which was similar to a study done by Armstrong, and it is shown in Table 1.

This study reveals that nitroimidazoles are the most commonly used oral and IV antimicrobials (33.92%), (31.4%) in DFU patients, whereas antifungals are the least prescribed (3.57%), (2.8%) and number of patients receiving combinational drugs was 69 (including IV and oral) in our survey the combinational drug prescribed was Augmentin which is the combination of amoxicillin and clavulanic acid and it was shown in Table 2.

The analysis revealed that twice a day is mostly prescribed frequency in diabetic foot patients, and once a day is the least prescribed. Based on the duration of antimicrobial therapy, most of the patients were prescribed 5 days of therapy (n = 73, 60.84%) due to several reasons, such as the development of resistance against antimicrobials. Based on the MMAS score,

patient adherence towards antimicrobials is moderate, i.e., medium adherence (n = 48, 40%). This study reveals that average number of drugs prescribed per encounter is 1.35, percentage of drugs prescribed with generic name – 56.17%, percentage of drugs prescribed from essential drug list (EDL) is 94%. The study emphasized the critical role of medication adherence for DFU patients receiving antimicrobial therapy, and it was shown in Table 3.

Due to the complexity of treatment plans, factors like polypharmacy, comorbidities, and cognitive or socioeconomic challenges frequently affect adherence. The MMAS-8 was used to assess adherence levels, highlighting the need for patient education, caregiver support, and regimen simplification to enhance compliance. The researchers concluded that comprehensive management, including proper antibiotic selection, counselling, and follow-ups, is essential for reducing infection severity, preventing amputations, and promoting effective healing in DFU patients. These findings can guide healthcare professionals in optimizing antibiotic prescribing practices and developing strategies to improve patient outcomes.

Table 1: Disease diagnosis

Type of diabetic foot infection	*n*=120	Percentage
Left diabetic foot	66	55
Right diabetic foot	54	45
Total	120	100

Table 2: Pharmacological classes of oral antimicrobial agents countered in diabetic foot ulcer patients

Class	No. of drugs	Percentage
Lincosamide antibiotic	16	28.57
Nitroimidazoles	19	33.92
Cephalosporins	10	17.85
Carbapenem antibiotic	6	10.71
Fluoroquinolones	3	5.35
Antifungals (Azoles)	2	3.57

Table 3: Different oral antibiotics encounters for the study population

Oral antimicrobials	*n*=120	Percentage
T. Augmentin	53	44.16
T. Dalocin	2	1.67
T. Metronidazole	19	15.84
T. Clindamycin	16	13.34
T. Fluconazole	2	1.67
T. Cefixime	10	8.34
T. Meropenem	6	5
T. Cimofloxacin	3	2.5

DISCUSSION

The study highlights several key findings regarding the demographic and clinical characteristics of patients at high risk of developing DFU, as well as the prescription patterns and medication adherence among patients. The majority of the study population was aged over 40–49 years (39.2%), which was comparable to the study done by Tadesse Tolosa *et al*. In addition, males constituted a larger proportion of the high-risk population (64.16%), which aligns with findings Pamela Di Giovanni *et al*. This gender disparity may be linked to lifestyle factors such as smoking, alcohol consumption, and higher stress levels among males. The study population revealed that 35.84% of alcoholic patients were more susceptible to developing DFUs, consistent with findings by Khan notable proportion of patients presented with left DFUs (n = 29), aligning with research by Armstrong *et al*. The most frequently prescribed treatments included oral Augmentin (44.16%) and injection Augmentin (13.34%). Combination therapy was administered to a significant majority (n = 69). Nitroimidazoles were the most prescribed antibiotics, both orally and intravenously, similar to findings by Singh *et al*. The majority of patients received twice-daily dosing, and the most common treatment duration was 5 days (60.84%), with 10 days being the least prescribed (0.84%), consistent with the study by Gariani, K, Pham *et al*. Furthermore, most patients exhibited medium adherence (n = 48, 40%) to antimicrobial therapy, comparable to the study by Sanz-Cordalan, *et al*. The percentage of drugs prescribed by generic name was 56.7% which was lower than the recommended World Health Organization (WHO) standard, and the percentage of drugs prescribed from EDL was 94.45% which aligns with the WHO standard. The percentage of drugs prescribed by generic name and the percentage of drugs prescribed from EDL indicate the rational use of antimicrobials.

Limitations

Although our study provided insightful information, there are a few important limitations that should be noted. First off, the study was conducted on a relatively small sample size of 120 patients, which may limit the generalizability of the findings to a broader population, especially across different regions or ethnic groups. Second, the study was conducted in a single tertiary care hospital in South India, which might not completely follow standard prescription guidelines at all time and clinical profiles of diabetic foot patients in other geographical locations.

CONCLUSION

This prospective observational study aimed to analyze the prescribing patterns and medication adherence of antimicrobials in diabetic foot patients in the department of general surgery. A total of 120 DFU patients' socio-demographic details,

prescription records were analysed and validated. The patient population is predominantly between the age group of 30–80 years, most reportedly with DFUs. For these patients, we designed, validated, and implemented MMAS-8 scale. The findings obtained from these patients help in shaping evidence-based antimicrobial consumption through MMAS score that impacts patient well-being and improves treatment outcomes.

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